General

Guideline Title

Cataracts in adults: management.

Bibliographic Source(s)

National Institute for Health and Care Excellence (NICE). Cataracts in adults: management. London (UK): National Institute for Health and Care Excellence (NICE); 2017 Oct 26. 23 p. (NICE guideline; no. 77).

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report Clinical Practice Guidelines We Can Trust.

= Poor = Fair = Good = Very Good = Excellent

Assessment	Standard of Trustworthiness
YES	Disclosure of Guideline Funding Source
	Disclosure and Management of Financial Conflict of Interests
	Guideline Development Group Composition
YES	Multidisciplinary Group
YES	Methodologist Involvement

	Patient and Public Perspectives
	Use of a Systematic Review of Evidence
	Search Strategy
	Study Selection
	Synthesis of Evidence
	Evidence Foundations for and Rating Strength of Recommendations
	Grading the Quality or Strength of Evidence
	Benefits and Harms of Recommendations
	Evidence Summary Supporting Recommendations
	Rating the Strength of Recommendations
	Specific and Unambiguous Articulation of Recommendations
	External Review
	Updating

Recommendations

Major Recommendations

Note from the National Guideline Clearinghouse (NGC): See the "Availability of Companion Documents" field for the full version of this guidance and related appendices.

The wording used in the recommendations in this guideline (for example, words such as 'offer' and 'consider') denotes the certainty with which the recommendation is made (the strength of the recommendation) and is defined at the end of the "Major Recommendations" field.

Patient Information

Give people with cataracts, and their family members or carers (as appropriate), both oral and written information. Information should be tailored to the person's needs, for example, in an accessible format. For more guidance on giving information to people and discussing their preferences, see the National Institute for Health and Care Excellence (NICE) guideline Patient experience in adult NHS services, particularly recommendations 1.2.12 and 1.2.13 on capacity and consent. (The NICE guideline on dementia is being updated, and is due to be published in summer 2018. The dementia guideline update will cover managing comorbidities [including ocular comorbidities] in people living with dementia.)

At Referral for Cataract Surgery

At referral for cataract surgery, give people information about:

- Cataracts:
  - What cataracts are
  - How they can affect vision
  - How they can affect quality of life
- Cataract surgery:
  - What it involves and how long it takes
  - Possible risks and benefits
  - What support might be needed after surgery
  - Likely recovery time
  - Likely long-term outcomes, including the possibility that people might need spectacles for some tasks
  - How vision and quality of life may be affected without surgery.

Before Cataract Surgery

At the preoperative outpatient appointment, review and expand on the topics in the previous recommendation, and give people information about:

- The refractive implications of different intraocular lenses (see "Before Cataract Surgery," below)
- Types of anaesthesia
- The person's individual risk of complications during or after surgery (for example, the risk of postoperative retinal detachment in people with high myopia; also see "Risk Stratification," below)
- What to do and what to expect on the day of cataract surgery
- What to do and what to expect after cataract surgery
- What support might be needed after surgery
- Medicines after surgery (for example, eye drops) and medicines that people may be already taking (for example, anticoagulants)
- The refractive implications after previous corneal refractive surgery, if appropriate (see "Biometry Formulas," below)
- Bilateral simultaneous cataract surgery, if appropriate (also see recommendations "Bilateral Surgery," below).

On the Day of Cataract Surgery

On the day of surgery, before the operation, give people information about:

- Their position on the list
- What to expect during and after surgery.

On the day of surgery, after the operation, give people information about:

- What visual changes to expect
- Signs and symptoms of potential complications to look out for
- Any restrictions on activities, for example, driving
- Possible problems and who to contact
- Emergency situations and who to contact
- Eye drops
- Pain management
- Their next appointment and who they will see.

After Cataract Surgery

At the first appointment after cataract surgery, give people information about:

- Eye drops
- What to do if their vision changes
- Who to contact if they have concerns or queries
- When it is appropriate to get new spectacles and how to do so

Second-eye cataract surgery if there is a cataract in the non-operated eye
Arrangements for managing ocular comorbidities.

Referral for Cataract Surgery

Base the decision to refer a person with a cataract for surgery on a discussion with them (and their family members or carers, as appropriate) that includes:

How the cataract affects the person's vision and quality of life
Whether 1 or both eyes are affected
What cataract surgery involves, including possible risks and benefits
How the person's quality of life may be affected if they choose not to have cataract surgery
Whether the person wants to have cataract surgery.

Do not restrict access to cataract surgery on the basis of visual acuity.

Preoperative Assessment and Biometry

Biometry Techniques

Use optical biometry to measure the axial length of the eye for people having cataract surgery.

Use ultrasound biometry if optical biometry:

Is not possible or
Does not give accurate measurements.

Use keratometry to measure the curvature of the cornea for people having cataract surgery.

Consider corneal topography for people having cataract surgery:

Who have abnormally flat or steep corneas
Who have irregular corneas
Who have significant astigmatism
Who have had previous corneal refractive surgery or
If it is not possible to get an accurate keratometry measurement.

Biometry Formulas

For people who have not had previous corneal refractive surgery, use 1 of the following to calculate the intraocular lens power before cataract surgery:

If the axial length is less than 22.00 mm, use Haigis or Hoffer Q.
If the axial length is between 22.00 and 26.00 mm, use Barrett Universal II if it is installed on the biometry device and does not need the results to be transcribed by hand. Use SRK/T if not.
If the axial length is more than 26.00 mm, use Haigis or SRK/T.

Advise people who have had previous corneal refractive surgery that refractive outcomes after cataract surgery are difficult to predict, and that they may need further surgery if they do not want to wear spectacles for distance vision.

If people have had previous corneal refractive surgery, adjust for the altered relationship between the anterior and posterior corneal curvature. Do not use standard biometry techniques or historical data alone.

Surgeons should think about modifying a manufacturer's recommended intraocular lens constant, guided by learning gained from their previous deviations from predicted refractive outcomes.

Second-eye Prediction

Consider using 50% of the first-eye prediction error in observed refractive outcome to guide calculations

for the intraocular lens power for second-eye cataract surgery.

Risk Stratification

Consider using a validated risk stratification algorithm for people who have been referred for cataract surgery, to identify people at increased risk of complications during and after surgery.

Explain the results of the risk stratification to the person, and discuss how it may affect their decisions.

To minimise the risk of complications during and after surgery, ensure that surgeons in training are closely supervised when they perform cataract surgery in:

- People who are at high risk of complications or
- People for whom the impact of complications would be especially severe (for example, people with only 1 functional eye).

Explain to people who are at risk of developing a dense cataract that there is an increased risk of complications if surgery is delayed and the cataract becomes more dense.

Intraocular Lens Selection

Please note: the recommendations around lens design and material have been removed to allow for further consideration.

Do not offer multifocal intraocular lenses for people having cataract surgery.

Offer monovision for use after cataract surgery to people who have either anisometropia or monovision preoperatively and would like to remain with it.

Addressing Pre-existing Astigmatism

Consider on-axis surgery or limbal-relaxing incisions to reduce postoperative astigmatism.

Preventing Wrong Lens Implant Errors

Before Cataract Surgery

Before the preoperative biometry assessment, ensure that the person's correct medical notes are used by confirming the person's:

- Name
- Address and
- Date of birth.

Immediately after the preoperative biometry assessment:

- Check that the biometry results include the person's name, address, date of birth and hospital number
- Either
  - Use electronic data transfer to upload the biometry results to an electronic health record or
  - Securely fix the printed biometry results to the person's medical notes
- Do not transcribe the results by hand.

At the preoperative assessment:

- Discuss the refractive implications of different intraocular lenses with the person
- Base the choice of intraocular lens on the person's chosen refractive outcome
- Record the discussion and the person's choices in their medical notes.

On the Day of Cataract Surgery

The person's medical notes, including biometry results, must be available in theatre on the day of the

cataract surgery.

Use a checklist based on the World Health Organisation (WHO) surgical safety checklist , modified to include the following cataract surgery checks, to ensure that:

- The person's identity has been confirmed and matches information in:
  - The consent form
  - The biometry results and
  - The person's medical notes
- The eye to be operated on has been checked and clearly marked
- There is only 1 intraocular lens in the theatre, that matches the person's selected lens type and prescription
- At least 1 additional identical intraocular lens is in stock
- Alternative intraocular lenses are in stock in case the selected lens needs to be changed if there are complications during surgery
- At least 2 members of the team, including the surgeon, have previously checked the appropriateness, accuracy and consistency of all:
  - Formulas
  - Calculations and
  - Intraocular lens constants.

Before giving the person anaesthetic, ensure that:

- There is only 1 intraocular lens in the theatre, that matches the person's selected lens type and prescription
- At least 1 additional identical intraocular lens is in stock
- Alternative intraocular lenses are in stock in case the selected lens needs to be changed if there are complications during surgery.

Immediately before the operation, the surgeon should:

- Confirm the person's identity and ensure that the correct medical notes are being used, especially if using electronic patient records
- Refer to the printed biometry results, not to transcribed information in the person's medical notes
- Refer to the person's medical notes to check which refractive outcome they preferred
- Verify that the correct intraocular lens has been selected and is available in theatre.

Occurrence of Wrong Lens Implant Errors

If a wrong lens is implanted, refer to NHS England's Never Events policy , and together with the whole multidisciplinary team:

- Undertake a root-cause analysis to determine the reasons for the incident
- Establish strategies and implementation tools to stop it from happening again.

Surgical Timing and Technique

Laser-assisted Cataract Surgery

Only use femtosecond laser-assisted cataract surgery as part of a randomised controlled trial that includes collection of resource-use data, comparing femtosecond laser-assisted cataract surgery with ultrasound phacoemulsification.

Bilateral Surgery

Offer second-eye cataract surgery using the same criteria as for the first-eye surgery (see "Referral for Cataract Surgery," above).

Consider bilateral simultaneous cataract surgery for:

People who are at low risk of ocular complications during and after surgery or
People who need to have general anaesthesia for cataract surgery but for whom general anaesthesia carries an increased risk of complications or distress.

Discuss the potential risks and benefits of bilateral simultaneous cataract surgery with people, which should include:

The potential immediate visual improvement in both eyes
How it will not be possible to choose a different intraocular lens based on the outcome in the first eye
The risk of complications in both eyes during and after surgery that could cause long-term visual impairment
The likely need for additional support after the operation.

Anaesthesia

Offer sub-Tenon's or topical (with or without intracameral) anaesthesia for people having cataract surgery.

If both sub-Tenon's and topical (with or without intracameral) anaesthesia are contraindicated, consider peribulbar anaesthesia.

Do not offer retrobulbar anaesthesia for people having cataract surgery.

Consider sedation, administered by an experienced ophthalmic anaesthetist, as an adjunct to anaesthesia for people if, for example:

They have high levels of anxiety
They have postural or musculoskeletal problems
Surgery is expected to take longer than usual.

Consider hyaluronidase as an adjunct to sub-Tenon's anaesthesia, particularly if trying to stop the eye moving during surgery.

Preventing and Managing Complications

Floppy Iris Syndrome

Consider intracameral phenylephrine to increase pupil size in people at risk of floppy iris syndrome.

Capsular Tension Rings

Do not use capsular tension rings in routine, uncomplicated cataract surgery.

Consider using capsular tension rings for people with pseudoexfoliation.

Endophthalmitis

Use preoperative antiseptics in line with standard surgical practice.

Use intracameral cefuroxime during cataract surgery to prevent endophthalmitis.

Use commercially prepared or pharmacy-prepared intracameral antibiotic solutions to prevent dilution errors.

Cystoid Macular Oedema

Consider topical steroids in combination with non-steroidal anti-inflammatory drugs (NSAIDs):

After cataract surgery for people at increased risk of cystoid macular oedema, for example, people with diabetes or uveitis
To manage cystoid macular oedema.

Offer topical steroids and/or NSAIDs after cataract surgery to prevent inflammation and cystoid macular oedema.

Posterior Capsule Rupture

When dealing with posterior capsule rupture, follow a protocol that covers:

- Removing vitreous from the wound and anterior chamber
- Minimising traction on the retina
- Removing lens fragments in the posterior chamber or vitreous cavity
- Removing soft lens matter
- Implications for any lens insertion.

Postoperative Eye Protection

Offer eye protection for people whose eye shows residual effects of anaesthesia at the time of discharge after cataract surgery.

Postoperative Assessment

Commissioners and service providers should ensure that the following are in place:

- Processes that identify complications after surgery and ensure that there is prompt access to specialist ophthalmology services.
- Processes to ensure that the UK Minimum Cataract Dataset for National Audit is completed.
- Arrangements so that healthcare professionals discuss second-eye cataract surgery with people who have a cataract in their non-operated eye.

Consider collecting patient visual function and quality-of-life data for entry into an electronic dataset.

Do not offer in-person, first-day review to people after uncomplicated cataract surgery.

Definitions

Strength of Recommendations

Some recommendations can be made with more certainty than others. The Guideline Committee (GC) makes a recommendation based on the trade-off between the benefits and harms of an intervention, taking into account the quality of the underpinning evidence. For some interventions, the GC is confident that, given the information it has looked at, most patients would choose the intervention. The wording used in the recommendations in this guideline denotes the certainty with which the recommendation is made (the strength of the recommendation).

For all recommendations, NICE expects that there is discussion with the patient about the risks and benefits of the interventions, and their values and preferences. This discussion aims to help them to reach a fully informed decision.

Interventions That Must (or Must Not) Be Used

The GC usually uses 'must' or 'must not' only if there is a legal duty to apply the recommendation. Occasionally they use 'must' (or 'must not') if the consequences of not following the recommendation could be extremely serious or potentially life threatening.

Interventions That Should (or Should Not) Be Used – a 'Strong' Recommendation

The GC uses 'offer' (and similar words such as 'refer' or 'advise') when they are confident that, for the vast majority of patients, an intervention will do more good than harm, and be cost effective. They use similar forms of words (for example, 'Do not offer…') when they are confident that an intervention will not be of benefit for most patients.

Interventions That Could Be Used

The GC uses 'consider' when they are confident that an intervention will do more good than harm for most patients, and be cost effective, but other options may be similarly cost effective. The choice of intervention, and whether or not to have the intervention at all, is more likely to depend on the patient's values and preferences than for a strong recommendation, and so the healthcare professional should spend more time considering and discussing the options with the patient.

Clinical Algorithm(s)

A National Institute for Health and Care Excellence (NICE) pathway titled "Cataracts overview" is provided on the NICE Web site .

Scope

Disease/Condition(s)

Cataracts

Guideline Category

Evaluation

Management

Treatment

Clinical Specialty

Family Practice

Ophthalmology

Optometry

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Health Care Providers

Nurses

Optometrists

Patients

Physician Assistants

Physicians

Guideline Objective(s)

- To improve care before, during and after cataract surgery by optimising service organisation, referral and surgical management, and reducing complications
- To improve the availability of information for people with cataracts before, during and after cataract surgery

Target Population

Adults (18 years and older) diagnosed with cataracts

Note:

The following subgroups have been identified as needing specific consideration: people with other conditions that may affect management, including people who are frail, older people, people with impaired cognitive function, people with impaired mobility, people in residential care and people with learning disabilities.

The following subgroups will be considered where appropriate:

People with an ocular or systemic condition that affects perioperative management, including people with diabetes, uveitis, glaucoma, retinal disease, macular degeneration, Fuch's corneal endothelial dystrophy, high myopia, hypermetropia and iris defects

People who are using medicines that affect perioperative management, including aspirin, oral anticoagulants, low-molecular-weight heparins, alpha antagonists and prostaglandin analogues.

Groups that will not be covered:

Children and young people under 18 years with congenital and/or juvenile cataracts, because the management pathway and issues associated with cataracts are very different in this group compared with adults.

People with trauma-induced cataracts, who have other pathologies related to the injury.

Interventions and Practices Considered

1. Provision of patient information at referral and before, the day of, and after surgery
2. Referral for surgery
3. Preoperative assessment (i.e., risk stratification) and biometry
4. Intraocular lens selection, including addressing pre-existing astigmatism
5. Preventing wrong lens implant errors
6. Surgical timing and technique (laser-assisted cataract surgery, bilateral surgery)
7. Anaesthesia
8. Preventing and managing complications
9. Postoperative assessment

Major Outcomes Considered

- Unaided and best-corrected visual acuity (distance and near)
- Contrast sensitivity
- Postoperative refractive outcomes
- Patient global improvement
- Patient independence (for example, activities of daily living, ability to drive)
- Patient satisfaction
- Adverse effects of treatment, including complications of surgical interventions (for example, surgically induced astigmatism)
- Accidents, including falls and traffic accidents
- Need for further treatment such as laser capsulotomy
- Health-related quality of life, including that of carers
- Resource use and costs

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Note from the National Guideline Clearinghouse (NGC) and the National Institute for Health and Care Excellence (NICE): See the "Availability of Companion Documents" field for the full version of this guidance and related appendices.

Review Search Strategies

Scoping Searches

Scoping searches were undertaken on the Web sites and databases (listed in alphabetical order in Appendix D) in November 2014 to provide information for scope development and project planning. Browsing or simple search strategies were employed.

Main Searches

Sources searched for the guideline

- Cochrane Database of Systematic Reviews – CDSR (Wiley)
- Cochrane Central Register of Controlled Trials – CENTRAL (Wiley)
- Database of Abstracts of Reviews of Effects – DARE (Wiley)
- Health Technology Assessment Database – HTA (Wiley)
- EMBASE (Ovid)
- MEDLINE (Ovid)
- MEDLINE In-Process (Ovid)
- PsycINFO (Ovid)

Identification of Evidence for Clinical Questions

The searches were conducted between July 2015 and November 2016. The re-run searches took place in January 2017.

The MEDLINE search strategies conducted by NICE are presented in section D2 in Appendix D. These were translated for use in all of the other databases.

In collaboration with Cochrane, the evidence for several review questions was identified by an update of an existing Cochrane review. Review questions in this category are presented in section D3.

In house study design filters were appended to some strategies. The type of study design filter used is indicated by each relevant review question. Details of the study design filters used can be found in section D4.

See the review protocols in Appendix C for inclusion/exclusion criteria.

Health Economics

Literature reviews seeking to identify published cost–utility analyses of relevance to the issues under consideration were conducted for all questions. In each case, the search undertaken for the clinical review was modified, retaining population and intervention descriptors, but removing any study-design filter and adding a filter designed to identify relevant health economic analyses. Search strategies are provided in full in Appendix D. In assessing studies for inclusion, population, intervention and comparator, criteria were always identical to those used in the parallel clinical search; only cost–utility analyses were included.

Number of Source Documents

See Appendix K: Evidence review flow charts (see the "Availability of Companion Documents" field) for information on results of literature searches and the number of included and excluded studies for each review question.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Overall Quality of Outcome Evidence in Grading of Recommendations Assessment, Development and Evaluation (GRADE)

Level	Description
High	Further research is very unlikely to change confidence in the estimate of effect.
Moderate	Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate.
Low	Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate.
Very Low	Any estimate of effect is very uncertain.

Methods Used to Analyze the Evidence

Meta-Analysis

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Note from the National Guideline Clearinghouse (NGC) and the National Institute for Health and Care Excellence (NICE): See the "Availability of Companion Documents" field for the full version of this guidance and related appendices.

Evidence Synthesis and Meta-analyses

Where possible, meta-analyses were conducted to combine the results of studies for each outcome. For continuous outcomes, where change from baseline data were reported in the trials and were accompanied by a measure of spread (for example standard deviation), these were extracted and used in the meta-analysis. Where measures of spread for change from baseline values were not reported, the corresponding values at study end were used and were combined with change from baseline values to produce summary estimates of effect. These studies were assessed to ensure that baseline values were balanced across the treatment groups; if there were significant differences at baseline these studies were not included in any meta-analysis and were reported separately.

Evidence of Effectiveness of Interventions

Quality Assessment

Grading of Recommendations Assessment, Development and Evaluation (GRADE) was used to assess the quality of evidence for the selected outcomes as specified in 'The guidelines manual (2014)'. Where

randomised controlled trials (RCTs) are available, these are initially rated as high quality and the quality of the evidence for each outcome was downgraded or not from this initial point. If non-RCT evidence was included for intervention-type systematic reviews then these are initially rated as low quality and the quality of the evidence for each outcome was downgraded or not from this point.

Methods for Combining Intervention Evidence

Meta-analysis of interventional data was conducted with reference to the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al., 2011).

Dichotomous outcomes were pooled on the relative risk scale (using the Mantel–Haenszel method).

Random-effects models (der Simonian and Laird) were fitted for all syntheses, as a conservative approach that reflected the underlying clinical heterogeneity of interventions (for example, differences in surgical technique and lens choice even in otherwise similar studies), regardless of whether such heterogeneity could be statistically identified.

Meta-analyses were performed in Cochrane Review Manager v5.3.

Minimal Clinically Important Differences (MIDs)

The Core Outcome Measures in Effectiveness Trials (COMET) database was searched to identify published minimal clinically important difference thresholds relevant to this guideline, which were considered along with any other published MIDs found during the clinical searches for the guideline, or any MIDs specified by the committee, and derived from their clinical experience. For relative risks, the GRADE default MID interval for dichotomous outcomes of 0.8 to 1.25 was used.

Cataract surgery has benefits across a wide variety of different domains of vision, with different people potentially benefiting in different ways. Examples would be improvements in visual acuity, depth of focus or contrast sensitivity, or reductions in the severity of optical abnormalities such as glare or halos. A person may gain a measurable benefit in one or some of these domains, without accruing any meaningful benefits in others. On this basis, the committee agreed that it would not be appropriate to specific quantitative MIDs for these intermediate outcome measures, as applying a population level MID to a dataset where only a proportion of people would be expected to benefit in that domain is likely to have the effect of inappropriately viewing differences as not being meaningful, where they may be for the proportion of people who do benefit.

The committee agreed, therefore, that wherever possible the focus would primarily be on measures such as visual function, quality of life or patient satisfaction, which should hopefully capture a more representative picture of the overall change. When decisions were made in situations where MIDs were not available, the 'Evidence to Recommendations' section of that review will make explicit the committee's view of the expected clinical relevance of the findings.

GRADE for Pairwise Meta-analyses of Interventional Evidence

The quality of the evidence for each outcome was downgraded where appropriate for the reasons outlined in Table 1 in the full version of the guideline.

Methods for Combining Direct and Indirect Evidence (Network Meta-analysis) for Interventions

Conventional pairwise meta-analysis involves the statistical combination of direct evidence about pairs of interventions that originate from 2 or more separate studies (for example, where there are two or more studies comparing A vs B).

In situations where there are more than 2 interventions, pairwise meta-analysis of the direct evidence alone is of limited use. This is because multiple pairwise comparisons need to be performed to analyse each pair of interventions in the evidence, and these results can be difficult to interpret. Furthermore, direct evidence about interventions of interest may not be available. For example studies may compare A vs B and B vs C, but there may be no direct evidence comparing A vs C. Network meta-analysis (NMA) overcomes these problems by combining all evidence into a single, internally consistent model,

synthesising data from direct and indirect comparisons, and providing estimates of relative effectiveness for all comparators and the ranking of different interventions.

Synthesis

Two separate frameworks and software packages were used for undertaking NMAs in this guideline, with the chosen method dependent on the specifics of the question (for certain datasets, it may be possible to run the preferred analysis in one program but not the other, or it may be particularly more efficient to use one package over another):

Hierarchical Bayesian NMA was performed using WinBUGS version 1.4.3. The models used reflected the recommendations of the NICE Decision Support Unit's Technical Support Documents (TSDs) on evidence synthesis, particularly TSD 2 ('A generalised linear modelling framework for pairwise and NMA of randomised controlled trials'; see http://www.nicedsu.org.uk). The WinBUGS code provided in the appendices of TSD 2 was used without substantive alteration to specify synthesis models.
Results were reported summarising 10,000 samples from the posterior distribution of each model, having first run and discarded 50,000 'burn-in' iterations. Three separate chains with different initial values were used.

Non-informative prior distributions were used in all models. Unless otherwise specified, trial-specific baselines and treatment effects were assigned N(0,1000) priors, and the between-trial standard deviations used in random-effects models were given U(0,5) priors. These are consistent with the recommendations in TSD 2 for dichotomous outcomes.

Fixed- and random-effects models were explored for each outcome, with the final choice of model based on deviance information criterion (DIC): if DIC was at least 3 points lower for the random-effects model, it was preferred; otherwise, the fixed effects model was considered to provide an equivalent fit to the data in a more parsimonious analysis, and was preferred.

The network-meta analyses in sections 7.2 (biometry formulas) and 7.3 (biometry lens constants) were conducted using this methodology.

Frequentist NMAs were undertaken using the netmeta package in R v3.3.1. This uses a graph-theoretical method which is mathematically equivalent to frequentist network meta-analysis (Rücker, 2012). Inconsistency was assessed using the overall I^2 value for the whole network, which is a weighted average of the I^2 value for all comparisons where there are multiple trials (both direct and indirect), and random-effects models were used if the I^2 value was above 50% (this was interpreted as showing the assumption of consistent, shared underlying means was not met, and therefore a fixed-effects model was inappropriate).
The network-meta analyses in sections 8.1 (lens design), 8.3 (multifocal vs monofocal intraocular lenses), 11.1 (anaesthesia) and 12.6 (preventing cystoid macular oedema) were conducted using this methodology.

Because different approaches and software had been applied, sensitivity analysis have previously been undertaken to establish whether this might have led to any substantive differences in output. Specimen dichotomous and continuous NMAs from the Bayesian analysis were rerun in the frequentist framework and generated results that were materially indistinguishable from the Bayesian version.

Applying GRADE to Network Meta-analysis

A modified version of the standard GRADE approach for pairwise interventions was used to assess the quality of evidence across the NMAs undertaken. While most criteria for pairwise meta-analyses still apply, it is important to adapt some of the criteria to take into consideration additional factors, such as how each 'link' or pairwise comparison within the network applies to the others. As a result, the criteria in sections 3.3.2.1 to 3.3.2.4 of the full version of the guideline were used when modifying the GRADE framework to an NMA. It is designed to provide a single overall quality rating for an NMA, which can then

be combined with pairwise quality ratings for individual comparisons (if appropriate), to judge the overall strength of evidence for each comparison.

Association Studies

In this guideline, association studies are defined as those reporting data showing an association of a predictor (either a single variable or a group of variables) and an outcome variable, where the data are not reported in terms of outcome classification (i.e., diagnostic/prognostic accuracy). Data were reported as hazard ratios (if measured over time) or odds ratios (if measured at a specific time-point).

Methods for Combining Association Study Evidence

Hazard ratios were pooled using the inverse-variance method, and odds ratios were pooled using the Mantel-Haenszel method. Adjusted odds ratios from multivariate models were only pooled if the same set of predictor variables were used across multiple studies.

Random-effects models (der Simonian and Laird) were fitted for all syntheses, as a conservative approach that reflected the underlying clinical heterogeneity of interventions (for example, differences in surgical technique and lens choice even in otherwise similar studies), regardless of whether such heterogeneity could be statistically identified.

Meta-analyses were performed in Cochrane Review Manager v5.3.

Minimal Clinically Important Differences (MIDs)

For odds ratios and adjusted odds ratios, an MID interval of 0.8 to 1.25 was used. No MID was specified for data reported as hazard ratios, and therefore the line of no effect was used.

Modified GRADE for Association Studies

GRADE has not been developed for use with predictive studies; therefore a modified approach was applied using the GRADE framework. Data from cohort studies was initially rated as high quality, and data from case-control studies as low quality, with the quality of the evidence for each outcome then downgraded or not from this initial point.

Non-comparative Studies

Throughout the guideline, wherever possible, data were always presented from comparative studies, with non-comparative studies only considered when this was the only data available. All non-comparative study designs (case series, audit data, surveys, etc.) were analysed under the same framework, regardless of the underlying question they sought to address.

Modified GRADE for Non-comparative Evidence

GRADE has not been developed for use with non-comparative studies; therefore a modified approach was applied using the GRADE framework, with the approach summarised in Table 3 in the full version of the guideline.

Qualitative Evidence

Methods for Combining Qualitative Evidence

Where multiple qualitative studies were identified for a single question, information from the studies was combined using a thematic synthesis. By examining the findings of each included study, descriptive themes were independently identified and coded. Once all of the included studies had been examined and coded, the resulting themes and sub-themes were evaluated to examine their relevance to the review question, the importance given to each theme, and the extent to which each theme recurred across the different studies. The qualitative synthesis then proceeded by using these 'descriptive themes' to develop 'analytical themes', which were interpreted by the reviewer in light of the overarching review questions.

CERQual for Qualitative Studies

CERQual was used to assess the confidence the committee has in each of the identified themes. Evidence from all qualitative study designs (interviews, focus groups etc.) was initially rated as high confidence and the confidence in the evidence for each theme was then downgraded from this initial point as detailed in Table 4 in the full version of the guideline.

Mixed-quantitative and Qualitative Evidence

Where a review question identified both relevant quantitative and qualitative evidence, these two types of evidence were analysed separately, using the relevant GRADE, modified GRADE or CERQual criteria defined above.

Health Economics

Economic evidence profiles, including critical appraisal according to the Guidelines manual, were completed for included studies; these are shown in Appendix J.

Economic studies identified through a systematic search of the literature are appraised using a methodology checklist designed for economic evaluations (NICE 2012; Appendix F). This checklist is not intended to judge the quality of a study per se, but to determine whether an existing economic evaluation is useful to inform the decision-making of the committee for a specific topic within the guideline.

There are 2 parts of the appraisal process. The first step is to assess applicability (that is, the relevance of the study to the specific guideline topic and the NICE reference case); evaluations are categorised according to the criteria in Table 5 in the full guideline.

In the second step, only those studies deemed directly or partially applicable are further assessed for limitations (that is, methodological quality); see categorisation criteria in Table 6 in the full guideline.

Where relevant, a summary of the main findings from the systematic search, review and appraisal of economic evidence is presented in an economic evidence profile alongside the clinical evidence.

Original health economic modelling was available to support the Guideline Committee's decision making for the cataract surgery questions addressed in sections 6.1 and 10.2. The Committee prioritised areas in which they felt that original analysis would be particularly informative, on the grounds of uncertainty and variation in current practice and/or the presence of complex trade-offs between the benefits, harms and costs of various courses of action. In questions for which no published evidence was identified and original analysis was not prioritised, the committee made a qualitative judgement about cost effectiveness by considering potential differences in resource use and cost between the options alongside the results of the review of evidence of clinical effectiveness.

External Collaborations

A number of questions in this guideline were undertaken as a collaboration between the NICE Internal Guidelines Team and the Cochrane Eyes and Vision Group. Data from relevant Cochrane reviews were supplied to the NICE team, and then either the full or relevant subsection of the review included as part of the evidence base. The following questions were undertaken as collaborations:

- What is the optimal strategy to facilitate simultaneous distance and near vision following cataract surgery? (section 8.4)
- What is the effectiveness of laser-assisted phacoemulsification cataract surgery compared with standard ultrasound phacoemulsification cataract surgery? (section 10.1)
- What is the effectiveness of prophylactic antiseptics (for example, topical iodine) and antibiotics to prevent endophthalmitis after cataract surgery? (section 12.5)
- What is the effectiveness of prophylactic topical corticosteroids and/or non-steroidal anti-inflammatory drugs (NSAIDs) to prevent inflammation and cystoid macular oedema after phacoemulsification cataract surgery? (section 12.6)

Details of the collaboration for each question are explained in the relevant chapters. Where Cochrane

reviews have been incorporated without substantive modification, the evidence is presented as it was in the original Cochrane review. Where modifications have been made to the published reviews (e.g., to standardise methodology with the rest of the guideline), these are presented in the same format as the original reviews undertaken for this guideline, and deviations from the data presented in the Cochrane reviews clearly specified.

Methods Used to Formulate the Recommendations

Expert Consensus

Informal Consensus

Description of Methods Used to Formulate the Recommendations

Note from the National Guideline Clearinghouse (NGC) and the National Institute for Health and Care Excellence (NICE): See the "Availability of Companion Documents" field for the full version of this guidance and related appendices.

This guideline was developed in accordance with the process set out in 'Developing NICE guidelines: the manual (2014)'. There is more information about how NICE clinical guidelines are developed on the NICE Web site. A booklet, 'How NICE clinical guidelines are developed: an overview for stakeholders, the public and the NHS' is available.

Rating Scheme for the Strength of the Recommendations

Strength of Recommendations

Some recommendations can be made with more certainty than others. The Guideline Committee (GC) makes a recommendation based on the trade-off between the benefits and harms of an intervention, taking into account the quality of the underpinning evidence. For some interventions, the GC is confident that, given the information it has looked at, most patients would choose the intervention. The wording used in the recommendations in this guideline denotes the certainty with which the recommendation is made (the strength of the recommendation).

For all recommendations, the National Institute for Health and Care Excellence (NICE) expects that there is discussion with the patient about the risks and benefits of the interventions, and their values and preferences. This discussion aims to help them to reach a fully informed decision.

Interventions That Must (or Must Not) Be Used

The GC usually uses 'must' or 'must not' only if there is a legal duty to apply the recommendation. Occasionally they use 'must' (or 'must not') if the consequences of not following the recommendation could be extremely serious or potentially life threatening.

Interventions That Should (or Should Not) Be Used – a 'Strong' Recommendation

The GC uses 'offer' (and similar words such as 'refer' or 'advise') when they are confident that, for the vast majority of patients, an intervention will do more good than harm, and be cost effective. They use similar forms of words (for example, 'Do not offer…') when they are confident that an intervention will not be of benefit for most patients.

Interventions That Could Be Used

The GC uses 'consider' when they are confident that an intervention will do more good than harm for most patients, and be cost effective, but other options may be similarly cost effective. The choice of intervention, and whether or not to have the intervention at all, is more likely to depend on the patient's

values and preferences than for a strong recommendation, and so the healthcare professional should spend more time considering and discussing the options with the patient.

Cost Analysis

Refer to Appendix J (see the "Availability of Companion Documents" field) for the full health economics report.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Refer to Sections 10 and 11 of 'Developing NICE guidance: the manual (2014)' for information on guideline review process.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of evidence supporting the recommendations is not specifically stated.

The type of evidence supporting each review area is detailed in the full version of the guideline (see the "Availability of Companion Documents" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Cataract surgery has benefits across a wide variety of different domains of vision, with different people potentially benefiting in different ways. Examples would be improvements in visual acuity, depth of focus or contrast sensitivity, or reductions in the severity of optical abnormalities such as glare or halos. A person may gain a measurable benefit in one or some of these domains, without accruing any meaningful benefits in others.
- Adequate explanation of the risks and benefits for the individual patient, ideally including treatment options and expertise offered by the surgeon, will assist the patient/carer in their decision-making regarding surgery. Clear explanations can allay anxiety, increase understanding and in turn secure patient cooperation and compliance. This helps them prepare preoperatively, during the operation, and in organising after care arrangements, such as organising a family carer or someone to assist in returning home after the operation.
- Awareness of the likelihood of particular complications in an individual patient's eye, and appropriate risk stratification, is widely acknowledged as an important component of careful preoperative assessment.

Refer to the "Trade-off between benefits and harms" sections in the full version of the guideline (see the "Availability of Companion Documents" field) for details about benefits of specific interventions.

Potential Harms

- Adverse effects of treatment, e.g., raised intraocular pressure (steroid-induced glaucoma), allergies (such as sensitivity to preservatives)
- The committee recognised that adverse events in cataract surgery involves a complex interplay of risks, with some complications increasing the likelihood of future complications. For example, patients who experience a posterior capsule rupture (PCR) during surgery are more likely to experience a retinal detachment, and retinal detachment is more likely in endophthalmitis, which is itself more likely in patients who have experienced PCR.
- Although it occurs very rarely (around 1 in 1,000 cases) infectious endophthalmitis is considered one of the most serious complications of cataract surgery as, even when treated promptly, it can result in complete loss of vision of the eye. The risk of endophthalmitis can be reduced, but not totally eliminated, by a number of measures.
- The committee acknowledged that some clinicians may worry about prescribing nonsteroidal anti-inflammatory drugs (NSAIDs) due to side effects such as stinging, burning, and conjunctival hyperaemia which could potentially lead to poor compliance. These types of side effects were also reported in some of the included studies.
- The committee noted that, when undertaking watchful waiting of patients, complication rates increase with increasing severity of cataract. It noted that, whilst not everyone gets worse (as many are stable), for those who do, this effect can be substantial and increases the risks of surgery.

Refer to the "Trade-off between benefits and harms" and "Adverse effects" sections in the full version of the guideline (see the "Availability of Companion Documents" field) for details about potential harms of specific interventions.

Qualifying Statements

Qualifying Statements

- The recommendations in this guideline represent the view of the National Institute for Health and Care Excellence (NICE), arrived at after careful consideration of the evidence available. When exercising their judgement, professionals are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or service users. The application of the recommendations in this guideline are not mandatory and the guideline does not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their carer or guardian.
- Local commissioners and/or providers have a responsibility to enable the guideline to be applied when individual health professionals and their patients or service users wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with compliance with those duties.
- Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

Implementation of the Guideline

Description of Implementation Strategy

Putting This Guideline into Practice

The National Institute for Health and Care Excellence (NICE) has produced tools and resources to help put this guideline into practice (see also the "Availability of Companion Documents" field).

Putting recommendations into practice can take time. How long may vary from guideline to guideline, and depends on how much change in practice or services is needed. Implementing change is most effective when aligned with local priorities.

Changes recommended for clinical practice that can be done quickly – like changes in prescribing practice – should be shared quickly. This is because healthcare professionals should use guidelines to guide their work – as is required by professional regulating bodies such as the General Medical and Nursing and Midwifery Councils.

Changes should be implemented as soon as possible, unless there is a good reason for not doing so (for example, if it would be better value for money if a package of recommendations were all implemented at once).

Different organisations may need different approaches to implementation, depending on their size and function. Sometimes individual practitioners may be able to respond to recommendations to improve their practice more quickly than large organisations.

Here are some pointers to help organisations put NICE guidelines into practice:

- Raise awareness through routine communication channels, such as email or newsletters, regular meetings, internal staff briefings and other communications with all relevant partner organisations. Identify things staff can include in their own practice straight away.
- Identify a lead with an interest in the topic to champion the guideline and motivate others to support its use and make service changes, and to find out any significant issues locally.
- Carry out a baseline assessment against the recommendations to find out whether there are gaps in current service provision.
- Think about what data you need to measure improvement and plan how you will collect it. You may want to work with other health and social care organisations and specialist groups to compare current practice with the recommendations. This may also help identify local issues that will slow or prevent implementation.
- Develop an action plan, with the steps needed to put the guideline into practice, and make sure it is ready as soon as possible. Big, complex changes may take longer to implement, but some may be quick and easy to do. An action plan will help in both cases.
- For very big changes include milestones and a business case, which will set out additional costs, savings and possible areas for disinvestment. A small project group could develop the action plan. The group might include the guideline champion, a senior organisational sponsor, staff involved in the associated services, finance and information professionals.
- Implement the action plan with oversight from the lead and the project group. Big projects may also need project management support.
- Review and monitor how well the guideline is being implemented through the project group. Share progress with those involved in making improvements, as well as relevant boards and local partners.

NICE provides a comprehensive programme of support and resources to maximise uptake and use of evidence and guidance. See the into practice pages for more information.

Also see Leng G, Moore V, Abraham S, editors (2014) Achieving high quality care – practical experience from NICE. Chichester: Wiley.

Implementation Tools

Clinical Algorithm

Mobile Device Resources

Patient Resources

Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

National Institute for Health and Care Excellence (NICE). Cataracts in adults: management. London (UK): National Institute for Health and Care Excellence (NICE); 2017 Oct 26. 23 p. (NICE guideline; no. 77).

Adaptation

Not applicable: The guideline is not adapted from another source.

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Guideline Committee

Guideline Committee

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

The effective management of conflicts of interests is an essential element in the development of the guidance and advice that the National Institute for Health and Care Excellence (NICE) publishes. Please refer to the NICE Web site for the Policy on Conflicts of Interest .

For a full list of guideline development group and service delivery group declarations of interest, see Appendix A (see the "Availability of Companion Documents" field).

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the National Institute for Health and Care Excellence (NICE) Web site . Also available for download in ePub or eBook formats from the NICE Web site . A large-print version is also available from the NICE Web site .

Availability of Companion Documents

The following are available:

Cataracts in adults: management. Full guideline. London (UK): National Institute for Health and Care Excellence (NICE); 2017 Oct. 210 p. (NICE guideline; no. 77). Available from the National Institute for Health and Care Excellence (NICE) Web site .

Cataracts in adults: management. Appendices. London (UK): National Institute for Health and Care

Excellence (NICE); 2017 Oct. (NICE guideline; no. 77). Available from the NICE Web site .

Cataracts in adults: management. Baseline assessment tool. London (UK): National Institute for Health and Care Excellence (NICE); 2017 Oct. (NICE guideline; no. 77). Available from the NICE Web site .

Cataracts in adults: management. Resource impact report. London (UK): National Institute for Health and Care Excellence (NICE); 2017 Oct. (NICE guideline; no. 77). Available from the NICE Web site .

Cataracts in adults: management. Resource impact template. London (UK): National Institute for Health and Care Excellence (NICE); 2017 Oct. (NICE guideline; no. 77). Available from the NICE Web site .

Developing NICE guidelines: the manual. London (UK): National Institute for Health and Care Excellence (NICE); 2014 Oct. Available from the NICE Web site .

Patient Resources

The following is available:

Cataracts in adults: management. Information for the public. London (UK): National Institute for Health and Care Excellence (NICE); 2017 Oct. (NICE guideline; no. 77). Available from the National Institute for Health and Care Excellence (NICE) Web site .

NGC Status

This NGC summary was completed by ECRI Institute on January 3, 2018. The guideline developer agreed to not review the content.

This NEATS assessment was completed by ECRI Institute on December 6, 2017. The guideline developer did not acknowledge or provide confirmation for this NEATS assessment.

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